



KONGSBERG

cNODE MiniS LF
Transponder
Instruction Manual

458122/B

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Document information

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Warning

The equipment to which this manual applies must only be used for the purpose for which it was designed. Improper use or maintenance may cause damage to the equipment and/or injury to personnel. You must be familiar with the contents of the appropriate manuals before attempting to operate or work on the equipment.

Kongsberg Maritime disclaims any responsibility for damage or injury caused by improper installation, use or maintenance of the equipment.

Disclaimer

Kongsberg Maritime AS endeavours to ensure that all information in this document is correct and fairly stated, but does not accept liability for any errors or omissions.

Support information

If you require maintenance or repair, contact Kongsberg Maritime's support organisation. You can also contact us using the following address: km.support.hpr@kongsberg.com. If you need information about our other products, visit <https://www.kongsberg.com/maritime>.

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About this manual

This manual includes all necessary documentation to safely install, operate and maintain the system.

Target audience

This manual is intended for all users of the system.

Online information

All end-user documentation can be downloaded from our website.

<https://www.kongsberg.com/maritime/>

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cNODE® is a registered trademark of Kongsberg Maritime AS in Norway and other countries.

cPAP® is a registered trademark of Kongsberg Maritime AS in Norway and other countries.

cNODE MiniS LF

Topics

[System description, page 7](#)

[Naming description, page 7](#)

[System units, page 8](#)

[Support information, page 10](#)

System description

cNODE MiniS LF is a family of transponders for underwater positioning and data links, and operates with HiPAP and cPAP transceivers.

The cNODE MiniS LF transponders are ideal for positioning ROVs. They have responder and transponder functionality, SSBL and LBL positioning, and telemetry capabilities.



cNODE MiniS LF is compatible with both Cymbal protocol for positioning and data link and FSK channels and telemetry.

The transponders have a depth rating of 7000 metres with a housing made of titanium. They have an internal tilt sensor $\pm 90^\circ$, an external on/off function and a pressure relief valve for safety purposes.

cNODE MiniS LF is powered from an internal rechargeable Li-Ion battery, and can be powered from ROVs 24 V during operation. An on-deck battery charger is available.

Update the configuration and the software via an external connector. TTC10 can be used for test and configuration.

Naming description

The transponder name consists of the model name, the model number, the transducer beam width and any options included.

Model name

cNODE MiniS

Model number

First digit = Frequency band

- 1 = 12 kHz

Second digit = Depth rating

- 7 = 7000 m

Transducer beamwidth

180 = 180° beam width

50V = 50° vertical beam width

Transponder identification

The transponders have labels that identifies

- the transponder name
- serial number
- default channels

System units

Transponders

The transponders have a depth rating of 7000 metres, and the housing is a titanium tube which is polyurethane coated to protect against corrosion and abrasion.

There are several models available with different beam widths. Some models have a pressure sensor. All transponders have an internal tilt sensor $\pm 90^\circ$ and a rechargeable Li-Ion battery. The transponder can be charged from an on deck battery charger or from a ROV's 24 V during operation.



Battery charger

Charging a battery is a process with an inherent risk so check applicable procedure(s) prior to charging in order to first assess the level of the inherent risk; and then, if necessary, apply suitable controls to mitigate the inherent risk before charging.

The battery charger charges the internal battery in approximately 1 hour. The LED charge status indicator shows when charging is complete.



Remote transducers

You need a transponder with a dedicated end cap for the remote transducers.

There are different remote transducers available for many uses.



The transducer cable has two Subconn connectors; MCIL4F and MCIL4M. The cable connects the remote transducer to the transponder.



TTC 10 (Transponder Test and Configuration unit)

The transponder test and configuration unit is designed for on deck testing and configuration of the transponders.

The TTC can test all Kongsberg Transponder low frequency channels, Cymbal and FSK. It can also test telemetry Transponders with internal and external sensors.



Support information

Should you need technical support for your cNODE MiniS LF system you must contact a Kongsberg Maritime office. A list of all our offices is available on our website. You can also contact our main support office in Norway.

Manuals and technical information can be downloaded from our support website.

Company name	Kongsberg Maritime AS
Address	Strandpromenaden 50, 3183 Horten, Norway
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Telephone 24h support	+47 33 03 24 07
Website	https://www.kongsberg.com/maritime/
Support website	Product support A to Z
Email address	km.support.hpr@kongsberg.com

General acoustic considerations

Take this information into consideration when deploying the transponders.

Acoustic range

The term *depth rating* should not be confused with the term *acoustic range*. The acoustic range is dependent on many factors, and some of the factors are outside the control of the user.

Vessel system

The directivity and coverage area for the vessel system is different, depending on which system you are using. Some systems have high directivity and omnidirectional coverage, while other systems has reduced coverage and less directivity. The transponder should always be within the coverage cone of the vessel system.

Transducer type

There are different types of transducers used with the transponders depending on operational needs. An omnidirectional transducer, such as a TD180, covers a large area, but has less acoustic power compared to a focused transducer, such as TD50V. A focused signal gives less footprint/coverage. The vessel should always be within the signal footprint of the transponder.

Tx Power

The ability to detect signals depends on the signal strength. The transmission power can be adjusted, both for the vessel system and for the transponder.

Acoustic noise

Acoustic noise is present at all vessels. At given conditions, the noise level can be excessive. A vessel's propellers and thrusters produce acoustic noise during manoeuvring, and in certain instances onboard machinery and pumps may also produce acoustic noise when in use. Heavy propeller/thruster use as well as waves can generate air bubbles, which can get in front of the vessel's transducer and block the acoustic signal.

Sound velocity and ray bending

Variations in water temperature affects the velocity of sound through the water column, and variations in the ocean's salinity level can bend the acoustic signal making it impossible for the signal to reach the vessel.

Getting started

Topics

[Charging the battery \(on-deck\), page 14](#)

[Turning on the transponder, page 15](#)

[Connecting the transponder to external power and responder signals, page 16](#)

[Changing between responder and transponder mode, page 17](#)

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[Acoustic test, page 17](#)

[Pre-deployment checks, page 18](#)

[Deployment, page 19](#)

[Recovering the transponder, page 19](#)

[Cymbal protocol, page 20](#)

Charging the battery (on-deck)

Charging a battery is a process with an inherent risk so check applicable procedure(s) prior to charging in order to first assess the level of the inherent risk; and then, if necessary, apply suitable controls to mitigate the inherent risk before charging. Follow the charging procedure carefully.

Context

The battery must be fully charged before long term storage and it is recommended to recharge the battery every 6 months to make sure the battery does not discharge completely over time. A completely discharged battery will not charge, as all lithium ion batteries.

To comply with regulations for air transportation, the battery must have 30 % or less remaining capacity.

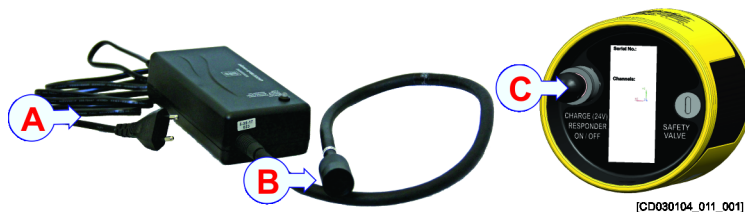
The battery charger will only start to charge if the battery capacity is lower than 96 %.

Caution

Equalize the temperature of the cNODE MiniS LF to between 10 °C and 40 °C before charging it.

For on-deck charging, use the cNODE battery charger only.

Never charge the battery unattended.



Procedure

- 1 Disconnect the on/off plug from the cNODE transponder.
- 2 Let the unit warm up or cool down to an ambient temperature of 10 °C to 40 °C before charging.
- 3 Connect the battery charger plug (B) to the connector on the cNODE MiniS LF marked CHARGE (C).
- 4 Connect the battery charger to mains (110 or 220 VAC).
- 5 Remove the power cord after charging, before removing the connector from the cNODE MiniS LF.

Result

The LED indicator on the charger flashes green when charging. It normally takes about 30 seconds before the charging starts and the LED indicator starts flashing green after

connecting the cNODE battery charger to the mains. The battery will be charged within 1 hour. The LED indicator will stay green when fully charged.

The transponder is ready for use.

Turning on the transponder

The transponder is designed for operation in water only. The transponder may be operated in air for test purposes over a short period of time.

Prerequisites

The transponder must be charged before use.



Procedure

- 1 Grease the connector with Molykote 44 Medium or equivalent grease. [Lubricating SEACON connectors, page 26](#)
- 2 Connect the on/off plug to the end cap connector.
- 3 Tighten the locking sleeve to the end cap connector.

Result

A buzz can be heard within 25 seconds as a confirmation that the transponder is activated.

Further requirements

It is recommended to test the transponder with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

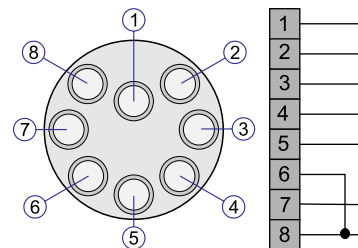
Connecting the transponder to external power and responder signals

The transponder can also be used as a responder unit.

Prerequisites

The transponder must be charged before use. This is the pin configuration for a male connector, as seen towards the connector (face view).

- 1
- 2
- 3
- 4 Responder trigger +
- 5 Responder trigger -
- 6 On/Off
- 7 External power (24 VDC)
- 8 Ground



Procedure

- 1 Use the cable with part number 402462 from Kongsberg.
- 2 Connect wire 6 and 8 in the pigtail (the ON/OFF function).
When 6-8 are linked, the transponder is ON.
With no connection between 6-8, the transponder is OFF.
- 3 Make sure that the external power supply 24 VDC is between 20 and 28 VDC.
- 4 Check the responder trigger signal.
- 5 Switch ON the unit by inserting the external power/responder cable.

Further requirements

It is recommended to test the transponder with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Changing between responder and transponder mode

The transponder can also be used as a responder unit.

Prerequisites

The transponder must be charged before use.

By default when the cNODE MiniS LF is turned on it is in transponder mode.

The signal input for the responder function must be between 2 and 6 ms with a positive pulse of 5 to 24 V.

Procedure

- 1 When responder trigger signals are received, the mode is automatically changed to responder.
- 2 Once the responder trigger signals stop, it will take 1 minute before the cNODE MiniS LF changes automatically back to transponder mode.

Turning on the TTC

Use the Transponder Test and Configuration unit to check that the transponder is ready for use.

Procedure

- 1 Open the suitcase.
- 2 Turn on the main power switch to start the program.

This takes approximately 1.5 minutes.



Acoustic test

Test the transponder acoustics to make sure it is functioning..

Procedure

- 1 Set **TTC Power** by using the left/right arrows to select the power level and tap **Set** to confirm your selection.
- 2 Connect the test transducer cable to the upper right connector.

- 3 Place the test transducer face to face with the transponder transducer.
- 4 Select the **Acoustic test** tab.
- 5 Type in the serial number, if necessary.
- 6 Type in the transponder channel number, if necessary.
- 7 Tap **Interrogate**.
- 8 A green indicator will flash on the display if there is acoustic contact with the transponder.
- 9 Tap **Interrogate** again to stop the acoustic test.

Pre-deployment checks

Before deploying the transponder, it is important to do the following checks to make sure the operation goes smoothly.

Context

It is recommended to test the transponder with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Procedure

- 1 Make sure the locking cord is in place.



- 2 If the unit has been altered from the factory pre-sets, check that the unit is configured according to your requirements.
- 3 Make sure the battery is fully charged.
- 4 Push the pressure relief valve in to confirm that it is flush with the end cap.
- 5 Switch the transponder ON by inserting the on/off plug.
- 6 Perform an acoustic test using a Transponder Test and Configuration (TTC) unit:
[Acoustic test, page 17](#)
 - a Interrogate the transponder.
 - b Read battery status and confirm that it will last for the upcoming operation.
 - c Read the power setting and confirm it is correct for the upcoming operation.

Result

The transponder is ready for use.

Deployment

The transponder is designed for operation in water only. The transponder may be operated in air for test purposes over a short period of time.

Prerequisites

The transponder must be charged before use. It is recommended to test the transponder with the Test and Configuration unit (TTC) to make sure it is working properly before operation.

Description

When you fit the transponder onto a vehicle/structure, the unit must be positioned with the transducer upright and there must be a clear line of sight between the transducer on the transponder and the vessel's transducer. Use a hose clamp with rubber protection to secure the transponder.

Internal tilt sensor

The transponder has an internal tilt sensor, where forward is towards the embossed logo, and upwards is toward the transducer.

Recovering the transponder

It is important to perform these recovery checks after every operation.

Procedure

- 1 Wash the unit thoroughly in warm fresh water to dissolve any salt deposits and clean off any sand or silt.
- 2 As an extra precaution, it is recommended that the unit is left to soak in fresh water to allow salt to dissolve and diffuse from hard-to-reach areas, such as crevices between mating parts.
Leave the unit to soak for 24 hours, or as long as practical conditions allow.
- 3 Dry off the unit and make sure that there is no water around the on/off plug or the external connector.
- 4 Turn the unit off by removing the on/off plug or disconnecting the external cable.

5 Recharge the unit.

Result

The transponder is ready for use.

Cymbal protocol

Cymbal is the acoustic protocol used both for positioning of subsea transponders in SSBL/LBL mod and data communication to and from transponders. It uses Direct Sequence Spread Spectrum (DSSS) signals.

The wide band carrier frequency of 12.8 kHz has 56 unique codes; L01 to L56.

Operating procedures

The transponder is operated from the HiPAP operator station APOS.

- Refer to APOS online help for descriptions.

Maintenance

Topics

[Safety features, page 23](#)

[Charging the battery \(on-deck\), page 23](#)

[Replacing the connector, page 25](#)

[Lubricating SEACON connectors, page 26](#)

[Battery charger status and troubleshooting, page 28](#)

Safety features

The transponder has a safety valve for releasing pressure that might build up inside.

Pressure relief valve

The transponder is fitted with a pressure relief valve at the bottom of the unit. The relief valve prevents overpressure. This valve will release the pressure if it exceeds approximately 1.0 bar.

The relief valve will normally pop out gently releasing the pressure. The valve is reset by firmly pushing the valve back in and is levelled with the surrounding surface.

Resetting the valve can in certain cases be obstructed due to production of acids and salts leaking from a damaged battery. In such cases the battery and circuits may have been damaged. Please contact Kongsberg Maritime for assistance.

Handling a transponder with an open relief valve or heated body

If the transponder body is hot when recovered, place the transponder fully submerged in a bucket of water for 24 hours or deploy into the sea permanently. If this method is impossible, the transponder can be cooled with lots of cold water using a fire hose.

If the transponder pressure relief valve emits gas or liquids when recovered, place the transponder fully submerged in a bucket of water for 24 hours or deploy into the sea permanently. If this method is impossible, the transponder can be cooled with lots of cold water using a fire hose.

Charging the battery (on-deck)

Charging a battery is a process with an inherent risk so check applicable procedure(s) prior to charging in order to first assess the level of the inherent risk; and then, if necessary, apply suitable controls to mitigate the inherent risk before charging. Follow the charging procedure carefully.

Context

The battery must be fully charged before long term storage and it is recommended to recharge the battery every 6 months to make sure the battery does not discharge completely over time. A completely discharged battery will not charge, as all lithium ion batteries.

To comply with regulations for air transportation, the battery must have 30 % or less remaining capacity.

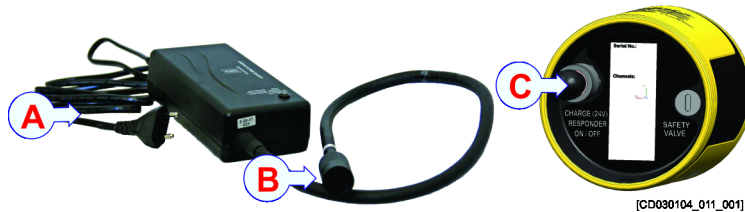
The battery charger will only start to charge if the battery capacity is lower than 96 %.

Caution

Equalize the temperature of the cNODE MiniS LF to between 10 °C and 40 °C before charging it.

For on-deck charging, use the cNODE battery charger only.

Never charge the battery unattended.



Procedure

- 1 Disconnect the on/off plug from the cNODE transponder.
- 2 Let the unit warm up or cool down to an ambient temperature of 10 °C to 40 °C before charging.
- 3 Connect the battery charger plug (B) to the connector on the cNODE MiniS LF marked CHARGE (C).
- 4 Connect the battery charger to mains (110 or 220 VAC).
- 5 Remove the power cord after charging, before removing the connector from the cNODE MiniS LF.

Result

The LED indicator on the charger flashes green when charging. It normally takes about 30 seconds before the charging starts and the LED indicator starts flashing green after connecting the cNODE battery charger to the mains. The battery will be charged within 1 hour. The LED indicator will stay green when fully charged.

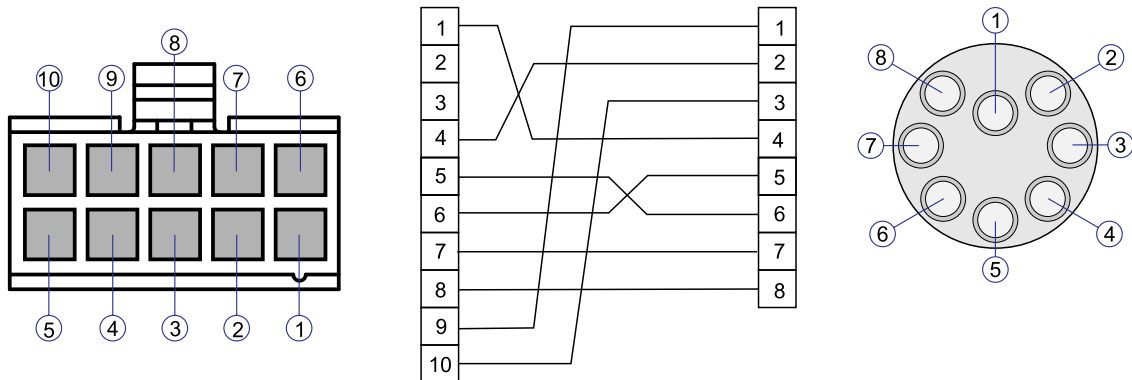
The transponder is ready for use.

Replacing the connector

The connector kit consists of a connector, a receptacle, crimp terminals and a cable sleeve.

Context

Cable specifications



This is the Molex plug seen from the back where the crimp terminals are installed and a face view of the connector.

Procedure

- 1 Remove the transducer.
- 2 Disconnect the transducer cable(s).
- 3 Disconnect the connector plug from the PCB.
- 4 Remove the battery and the PCB.
- 5 Cut the Molex plug.



- 6 Use a wrench to remove the connector.
Use a wrench with a slim 20 mm socket. The outer diameter of the socket should be 24 mm or less to avoid damaging the transponder housing.



- 7 Clean the threads in the transponder housing.
- 8 Feed the wires on the new connector through the connector hole.
- 9 Use Loctite 243 on the threads and apply activator.



- 10 Insert the connector.
- 11 Tighten the connector to 10 Nm.
- 12 Install the crimp terminals in the receptacle according to the cable drawing.
- 13 Put the battery and the PCB back in the tube.
- 14 Check and replace any damaged O-rings on the transducer before replacing it.
- 15 Connect the new connector and the transducer to the PCB.
- 16 Install the transducer.

Lubricating SEACON connectors

SEACON connectors require very little maintenance. They are designed to be used in harsh environments and thus limited amounts of dirt and grit do not affect their performance.

Context

It is recommended that, upon disconnecting or retrieving the system, the connectors be cleaned, to storage (if possible, remate with dummy plugs). Prior to deployment the following maintenance procedure is recommended:

Procedure

- 1 Demate the connector set.

- 2 Flush connector interface with fresh water (deionized water if available), remove all dirt, grit and grease.
- 3 Inspect for damage in sealing areas, excessive corrosion, debonding of the cable and connector interface and cuts in the cable jacket.
- 4 Apply thin film of dielectric compound (DC) grease, silicon based, to sealing areas of male connector and across the face of the female connector. If the bulkhead connector (BC) is removed from its housing then replace facial o-ring and make sure that o-rings are lubricated and in good condition. The use of some oil-based propellants in spray cans can cause conductivity problems in neoprene.
- 5 Mate the connector halves, wipe away any excess grease off the interface line of the mated set.

Battery charger status and troubleshooting

The battery charger has a LED indicator for easier troubleshooting.

LED indicator	What it means	How to fix this
Flashing green	The battery is charging	
Steady green	The battery is fully charged	
Flashing red	<ul style="list-style-type: none"> The charger is not connected to the transponder Failure in charger/transponder connection Charger might be faulty 	<p>Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac).</p> <p>If the LED indicator is still flashing red:</p> <p>Charger might be faulty Contact your local Kongsberg Maritime office.</p>
Steady red	<ul style="list-style-type: none"> The battery temperature might be outside the charging specification Possible battery failure 	<ul style="list-style-type: none"> Let the unit warm up or cool down to an ambient temperature of 10 °C to 40 °C before charging. Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac). <p>If the LED indicator is still flashing red:</p> <p>Possible battery failure Contact your local Kongsberg Maritime office.</p>
No light	It normally takes about 30 seconds before the battery starts charging and the LED indicator starts flashing green after connecting the cNODE battery charger to the cNODE MiniS LF and then to the mains (110 or 220 VAC).	<p>Disconnect all cables and wait 1 minute before reconnecting the cables and connect power supply to mains (110 or 220 Vac).</p> <p>The charger or cNODE MiniS LF might be faulty. Contact your local Kongsberg Maritime office.</p>

Spare parts

Topics

[Ordering spare parts, page 30](#)

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[Test and configuration cable \(PC to MiniS\) spare part, page 32](#)

Ordering spare parts

To make the order process as short and efficient as possible, you must provide accurate information about the product, the part you need, and yourself.

The following information must be provided with your order:

- Part name and/or description
- Our part number
- Number of items required
- Your shipment address
- Preferred shipment method
- Required date of delivery from us

For certain spare parts (typically complete units, printed circuit boards and software) the vessel name is also useful, as this allows us to update our vessel database.

cNODE MiniS 17-180 Ti spare part

- **Part name:** MiniS 17-180 Ti
- **Part number:** 435940



cNODE MiniS 17-S Ti spare part

- **Part name:** MiniS 17-S Ti
- **Part number:** 445515



TDR50V spare part

- **Part name:** TDR50V Steel
- **Part number:** 330015
- **Part name:** TDR50V Titanium
- **Part number:** 409238



Transducer cable spare part

- **Part name:** cNODE MiniS LF transducer cable
- **Part number:** 345772



Battery charger spare part

- **Part name:** cNODE MiniS LF battery charger
- **Part number:** 404199



ON/OFF plug spare part

- **Part name:** ON/OFF plug with locking sleeve
- **Part number:** 401633



Configuration or power cable spare part

- **Part name:** Pigtail cable with locking sleeve
- **Part number:** 408094



Floating collar spare part

- **Part name:** Floating collar
- **Part number:** 442750



Transducer guard spare part

- **Part name:** Transducer guard
- **Part number:** 439442



TTC 10 spare part

- **Part name:** TTC 10 (Transponder Test and Configuration unit)
- **Part number:** 463018



Test and configuration cable (TTC to MiniS) spare part

- **Part name:** Test and configuration cable (TTC to MiniS) spare part
- **Part number:** 407647

Test and configuration cable (PC to MiniS) spare part

- **Part name:** Test and configuration cable (PC to MiniS) spare part
- **Part number:** 407648

Drawing file

Topics

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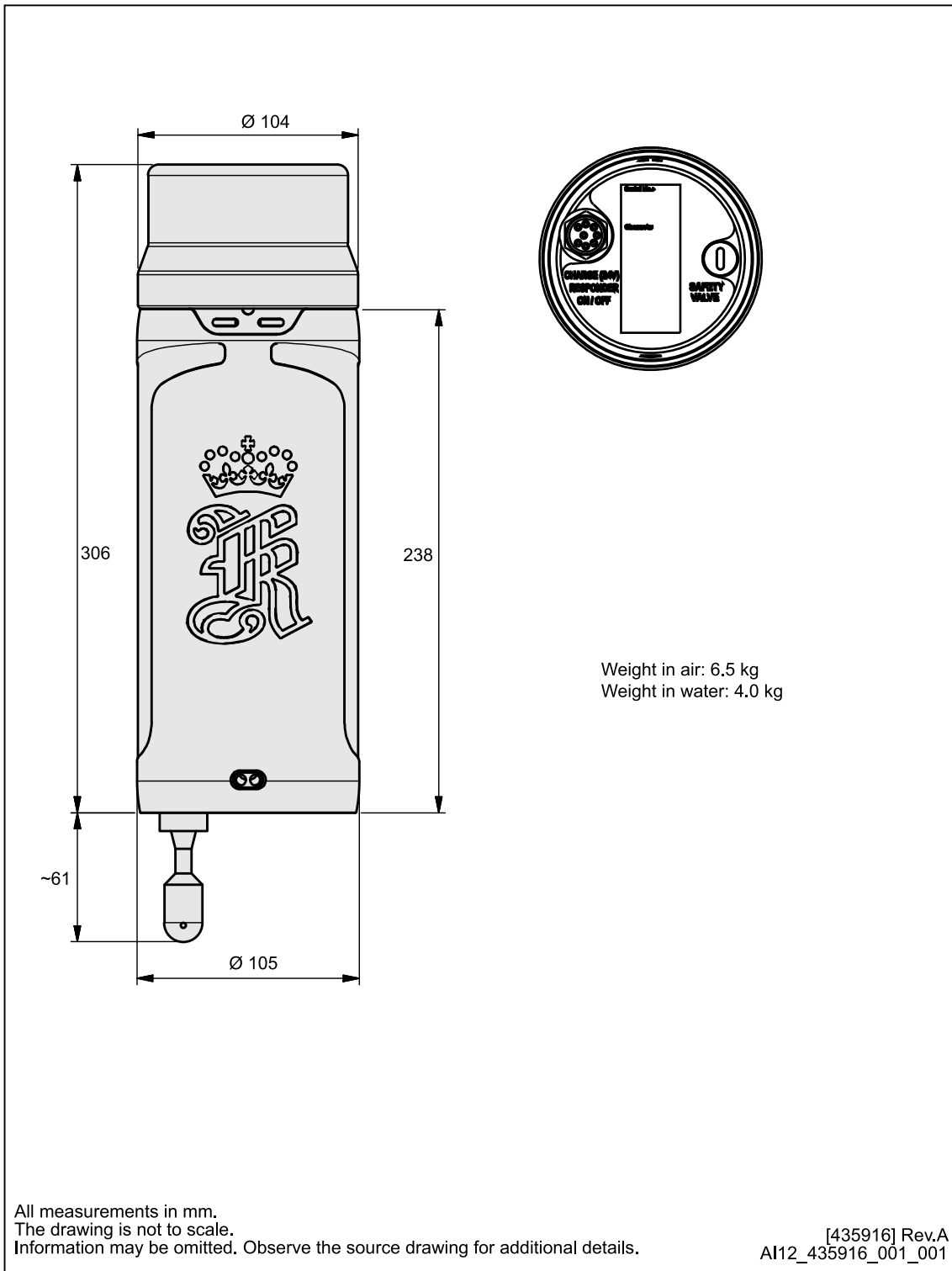
[TDR50V Ti dimensions , page 37](#)

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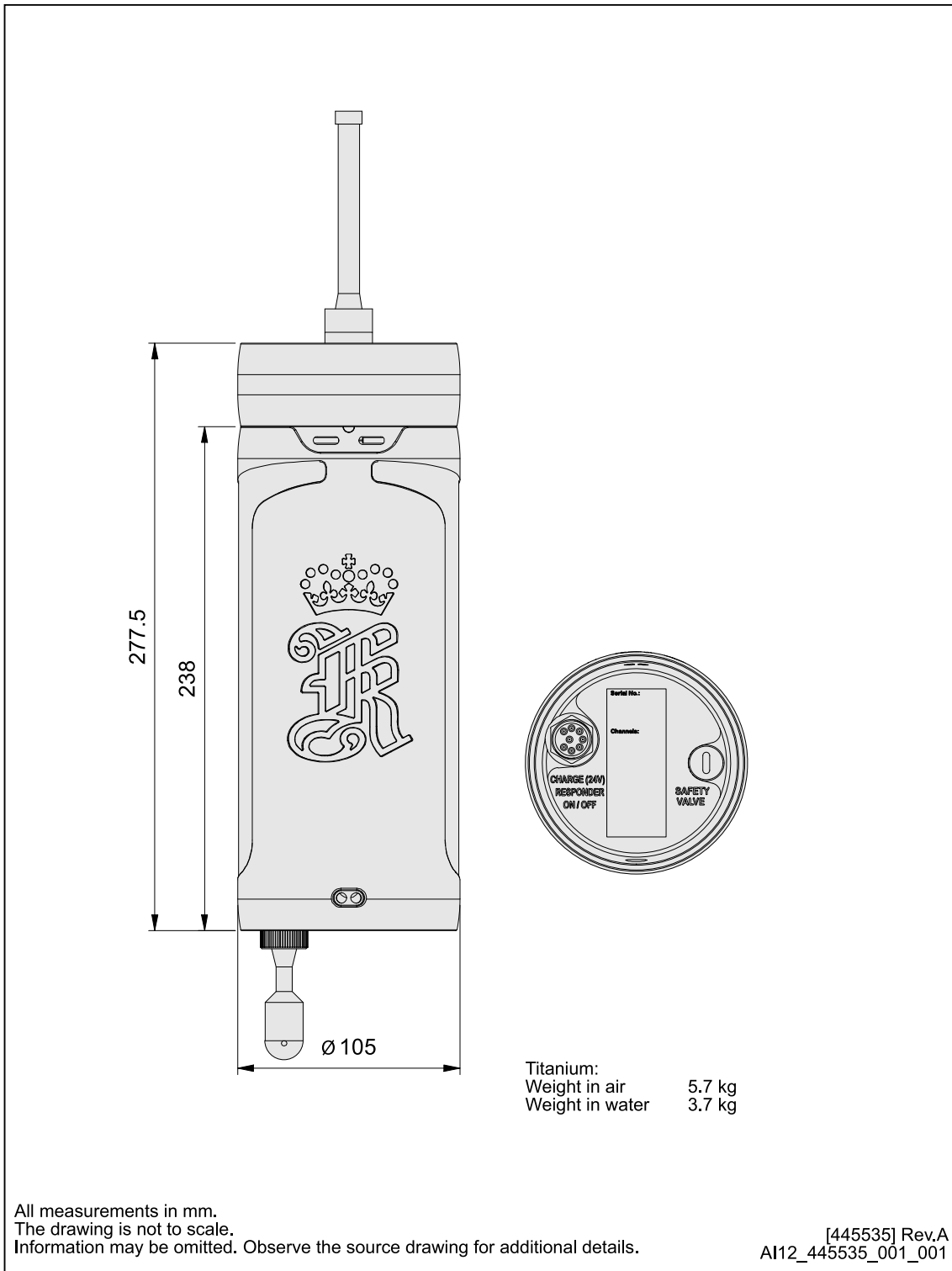
[Floating collar dimensions, page 39](#)

[Configuration or power connector pinout, page 40](#)

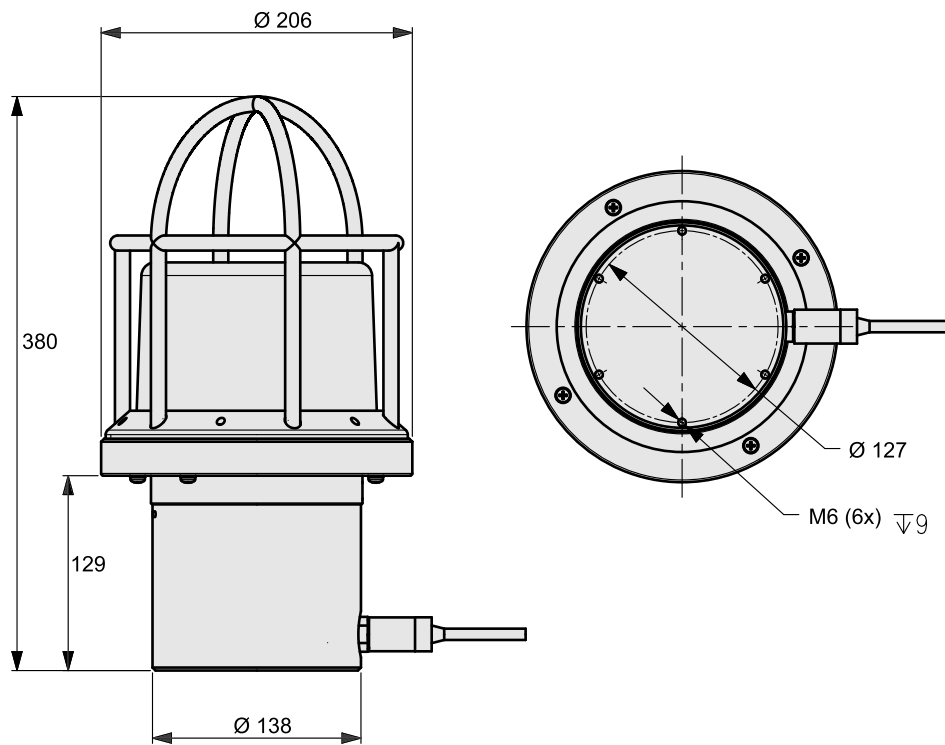
cNODE MiniS 17-180 Ti dimensions



cNODE MiniS 17-S Ti dimensions



TDR50V St dimensions

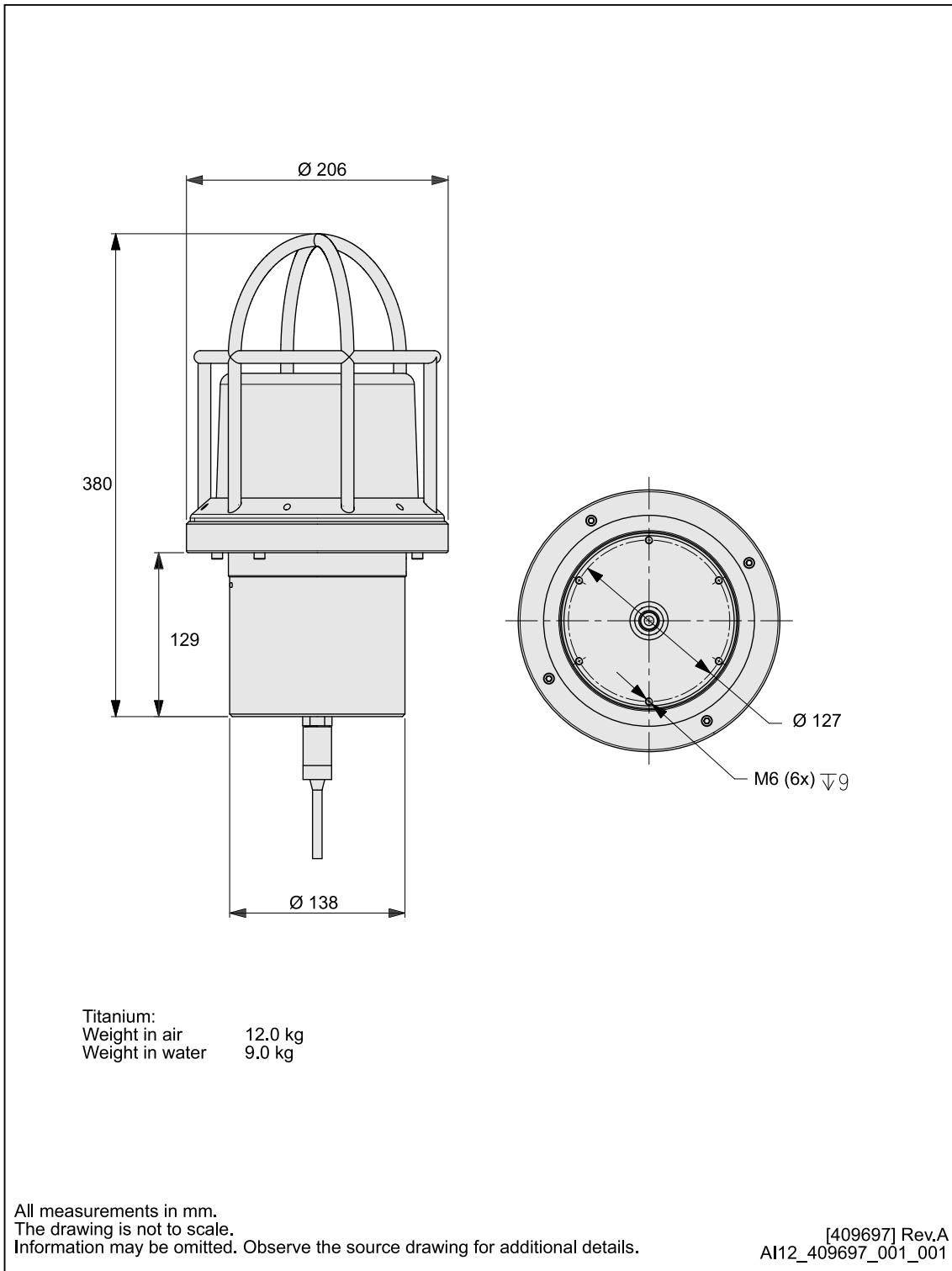


Steel:
Weight in air 23.5 kg
Weight in water 18.5 kg

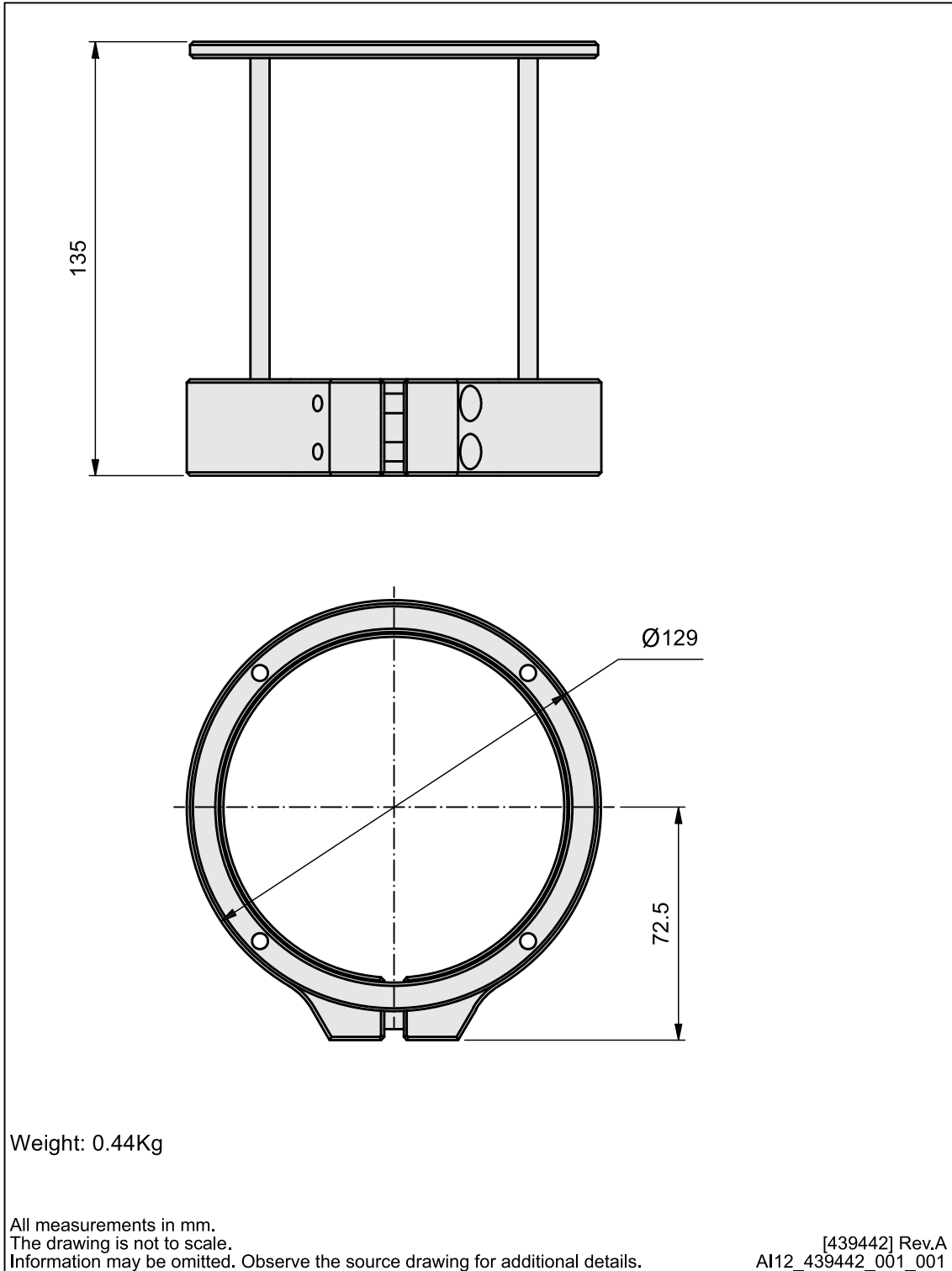
All measurements in mm.
The drawing is not to scale.
Information may be omitted. Observe the source drawing for additional details.

[330029] Rev.A
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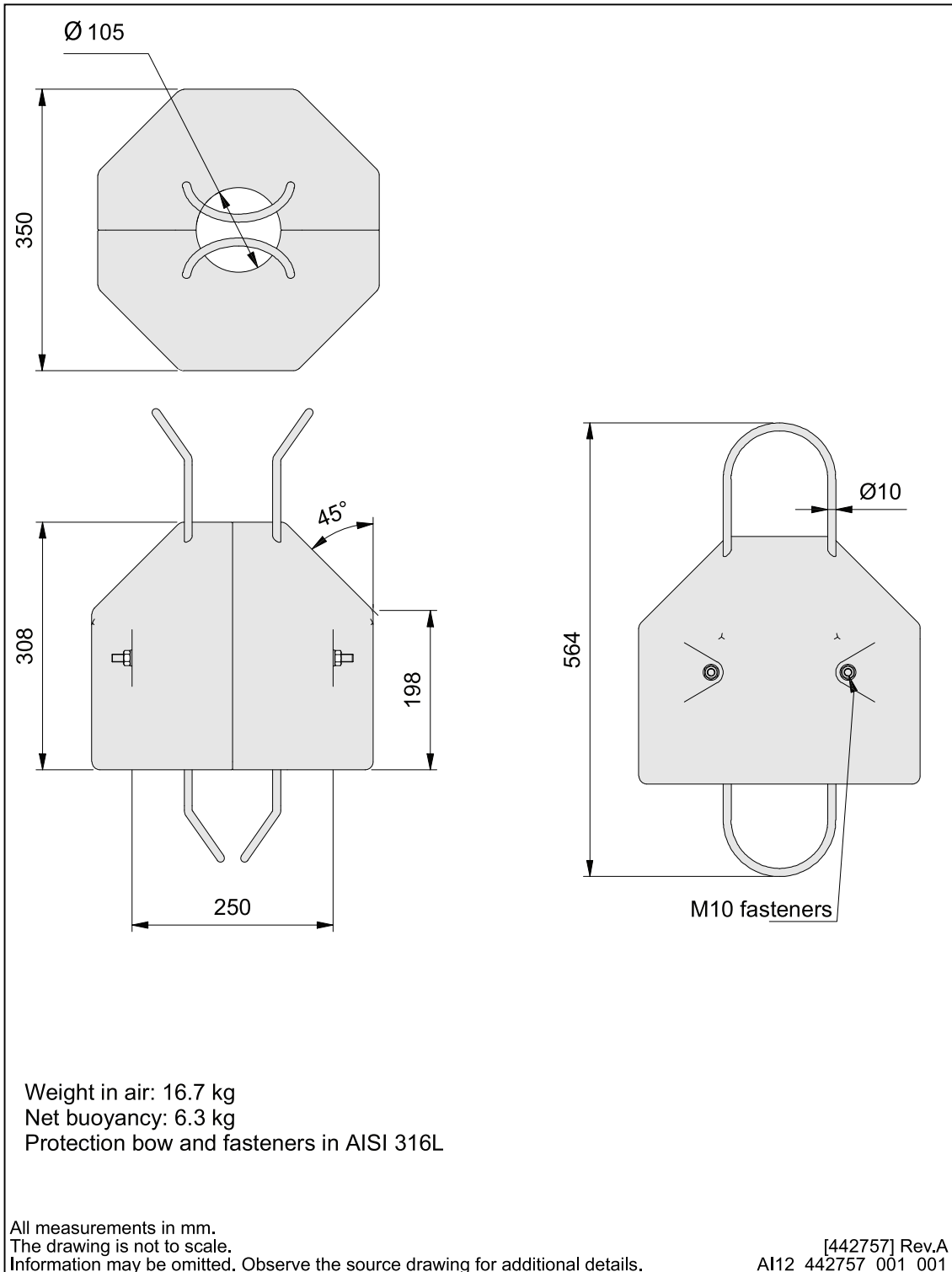
TDR50V Ti dimensions



Transducer guard dimensions



Floating collar dimensions



Configuration or power connector pinout

The external connector is for configuration, responder function, on/off function and charging.

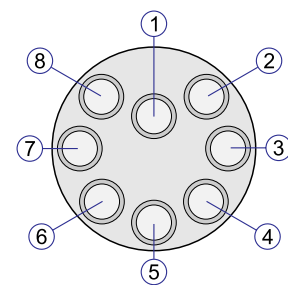
This is the pin configuration for a male connector, as seen towards the connector (face view).

Pin 1, 2 and 3 is for configuration.

Pin 4 and 5 is for responder function.

Pin 6 and 8 is for on/off function.

Pin 7 and 8 is for external power.



Pin number	Signal
1	
2	
3	
4	Responder trigger +
5	Responder trigger -
6	On/Off
7	External power (24 VDC)
8	Ground

Technical specifications

Topics

[Performance specifications, page 42](#)

[Weights and outline dimensions, page 43](#)

[Power requirements, page 44](#)

[Environmental requirements, page 44](#)

Performance specifications

These performance specifications summarize the main functional and operational characteristics of the system.

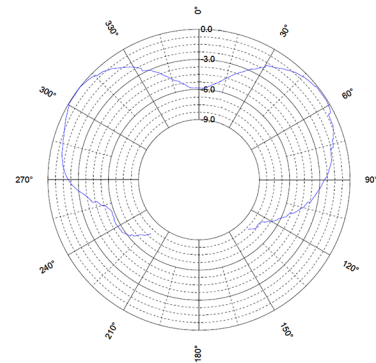
- **Depth rating:** 7000 m
- **Operating frequency:** 12 kHz
- **Responder trigger signal:** 5 - 25 V positive logic pulse (2 - 6 ms)
- **External connector:** Seacon MCBH8MDO
- **Internal tilt sensor:** $\pm 90^\circ$
- **Pigtail cable:** Seacon MCIL8F, 0.60 m
- **Operating battery lifetime:**
 - **Quiescent battery lifetime:** 30 days
 - **Cymbal (Low power, 1 second update rate):** > 2.5 days
 - **Cymbal (Low power, 3 second update rate-power saver mode):** > 7 days
 - **FSK (High power, 3 second update rate):** > 4.5 days
 - **Battery capacity with external power:** 75 to 80 %

MiniS 17-S Ti

- **Operating range:** 10,000 – 13,000 m (depending on the transducer)

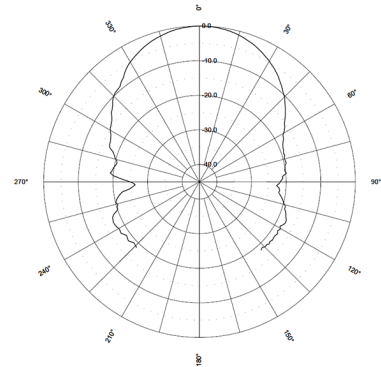
MiniS 17-180 Ti

- **Transducer beam:** 180°
- **Trigger level:** < 85 dB
- **Source level:** 188 dB
- **Operating range:** 10,000 m (depending on conditions)



TDR50V

- **Transducer beam:** 50° Vertical
- **Trigger level:** < 80 dB
- **Source level:** 203 dB



Weights and outline dimensions

These weights and outline dimension characteristics summarize the physical properties of the system.

Model	Height	Diameter	Weight in air	Weight in water
MiniS 17-S Ti	277.5 mm	105 mm	5.7 kg	3.7 kg
MiniS 17-180 Ti	306 mm	105 mm	6.5 kg	4.0 kg
TDR50V Titanium	380 mm	206 mm	12.0 kg	9.0 kg
TDR50V Steel	380 mm	206 mm	23.5 kg	18.5kg

Model	Depth	Width	Height	Weight
Battery charger	80.7 mm	157.7 mm	47.3 mm	0.6 kg
Floating collar	350 mm	350 mm	564 mm	16.7 kg
Transducer guard	129 mm	137 mm	135 mm	0.44 kg

Power requirements

These power characteristics summarize the supply power requirements for the system.

Battery

- **Battery type:** Li-Ion (LiFePO₄)
- **Nominal capacity:** 58 Wh

Battery charger

- **Input voltage:** 115/230 VAC 50–60 Hz maximum 1.4 A
- **Output voltage:** 24 VDC, 4 A

External power

- **Input voltage:** 24 VDC (20-28 VDC), 1 A/24 W

Environmental requirements

These environmental specifications summarize the temperature and humidity specifications for the system.

- **Operating temperature:** -5 to 55 °C
- **Storage temperature:** -30 to 70 °C
- **Vibration range:** 2 - 100 Hz
- **Excitation level:** 2-13.2 Hz \pm 1.4 mm, 13.2-100 Hz 1 g

Battery safety

Topics

- SECTION 1: Identification, page 46
- SECTION 2: Hazards identification, page 46
- SECTION 3: Composition, page 47
- SECTION 4: First aid measures, page 47
- SECTION 5: Firefighting measures, page 48
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- SECTION 10: Stability and reactivity, page 50
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- SECTION 13: Disposal considerations, page 51
- SECTION 14: Transport information, page 51
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- SECTION 16: Other information, page 52

SECTION 1: Identification

The specification describes the technical parameters for the battery.

The cNODE MiniS LF contains a custom made 58 Wh Li-Ion battery.

- **Product name:** cNODE MiniS Battery
- **Part number:** 396782
- **Manufacturer:** Kongsberg Maritime AS
- **Address:** Strandpromenaden 50, 3190 Horten, Norway
- **Telephone:** +47 33 03 24 07 (24 h)
- **Email address:** km.support.hpr@kongsberg.com
- **Website :** <https://www.kongsberg.com/maritime>

Note

The battery is a solid and sealed unit. The battery cannot be opened to reveal the individual cells.

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer. <https://lithiumwerks.com/>

SECTION 2: Hazards identification

The battery is not labelled with a hazmat label. It is not classified as dangerous or hazardous when undamaged and used as intended, and as such it is exempted from GHS (Globally Harmonized System of Classification and Labelling of Chemicals) classification and labelling.

Do not open, disassemble, crush or burn the battery. The battery contains dangerous ingredients. Exposure to the ingredients contained within the battery cells could be harmful. The battery cells include a barrier, preventing exposure to the user and environment. The battery cells are not classified as hazardous according to Regulation (EC) No. 1272/2008.

The chemicals in the battery cells are contained in a sealed enclosure. Risk of exposure occurs only if the cell is mechanically, thermally or electrically abused to the point of compromising the enclosure. If this occurs, exposure to the electrolyte solution contained within can occur by inhalation, ingestion, eye contact and skin contact. The electrolyte solution can be corrosive and may cause irritation and burns.

Other hazards

- **Overcharge:** If the cells that form the battery block are overcharged, the results may be a thermal runaway.

- **External fire:** Internal pressure and thermal runaway may be the consequences if the cells inside the battery are exposed to temperatures above 85 °C.
- **Internal short circuit:** Internal short circuit in a cell. Destruction of the separator can cause a short circuit between the anode and cathode. Thermal runaway and fire is possible.
- **Water ingress:** Internal pressure, thermal runaway and chemical reactions may be the consequence.

The transponder is fitted with a pressure relief valve at the bottom of the unit. The relief valve prevents overpressure. Noxious gases and ingredients will then leak out of the transponder until the chemical reactions have stopped. Products generated by the chemical reactions during an emergency may however clog this pressure release valve.

SECTION 3: Composition

The battery is solid with a hard surface.

The lithium metal cells have the following chemical formula:

Li-Ion (LiFePO₄)

- **Negative electrode:** Lithium
- **Positive electrode:** Carbon
- **Nominal capacity:** 58 Wh
- **Lithium weight:** 5.3 g

Note

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer.

- **Manufacturer:** Lithium Werks
- **Cell type:** APR18650
- **Manufacturer's website:** <https://lithiumwerks.com>

SECTION 4: First aid measures

The battery will release toxic fumes if burned or exposed to fire.

If subjected to gas from a burning battery, remove the source of contamination or move yourself and any victims to fresh air. Seek medical advice.

- **Inhalation:** The chemicals are lung irritant. Avoid inhaling any vented gases. Remove the victim and yourself from exposure. Rest and keep warm. If breathing is difficult, seek emergency medical attention.

- **Skin contact:** The chemicals are skin irritant. Rinse immediately with a lot of water and soap for at least 15 minutes. Wipe immediately away excess material with waterless hand cleaner. Remove contaminated clothing and wash it thoroughly before reuse.
- **Eye contact:** The chemicals are eye irritant. Flush immediately with a lot of clear tepid water for at least 15 minutes.
- **Ingestion:** Exposure to the chemicals may cause tissue damage to throat and gastro/respiratory tract if swallowed. If ingested, rinse mouth and surrounding area with tepid water. Dilute by drinking plenty of water. Seek medical advice.

SECTION 5: Firefighting measures

The transponder is designed to withstand damage to the internal battery pack. Non-flammable material is used. In case of fire, move the battery away from the fire area if you can do it without compromising your own safety. Extreme mechanical abuse to the battery may result in a ruptured seal and exposure.

The individual cells in the battery pack contain a flammable liquid electrolyte that may vent, ignite and produce sparks when subjected to high temperatures (> 150 °C/302 °F), when damaged or abused. A burning battery can ignite other batteries in close proximity.

Suitable extinguishing media are dry chemical, CO₂, water spray or regular foam. Cool down the battery/transponder with copious amounts of cold water.

The interaction with water or water vapour and exposed lithium hexafluorophosphate (Li PF₆) may result in the generation of hydrogen and hydrogen fluoride (HF) gas. Contact with battery electrolyte may be irritating to skin, eyes and mucous membranes. Fire will produce irritating, corrosive and/or toxic gases. Fumes may cause dizziness or suffocation. Don a self-contained breathing apparatus (SCBA).

Note

In case of an external fire, always remove transceiver units and lithium batteries.

SECTION 6: Accidental release measures

During normal operation, accidental release measures are not applicable. Extreme mechanical abuse to the battery may result in a ruptured seal and exposure.

As an immediate precautionary measure, isolate the spill or leak area at least 25 metres (75 feet) in all directions. Keep unauthorized personnel away. Stay upwind, and keep out of low areas. Ventilate closed areas before entering. Wear adequate personal protective equipment.

Prevent material from contaminating soil and from entering sewers or waterways. Stop the leak if safe to do so. Contain the spilled liquid with dry sand or earth. Clean up the spills immediately.

Absorb spilled material with an inert absorbent (dry sand or earth). Scoop contaminated absorbent into an acceptable waste container. Collect all contaminated absorbent and dispose of it according to relevant regulations. Scrub the area with detergent and water; collect all contaminated water for proper disposal.

SECTION 7: Handling and storage

Do not open, disassemble, crush or burn the battery.

- 1 Do not expose the battery to water, sea water or other high-conductivity liquids.
- 2 Avoid mechanical or electrical abuse.
- 3 Do not expose the battery to temperatures outside the range of -30 °C to +70 °C.
- 4 Store in a dry location.

To minimize any adverse effects on the battery performance it is recommended that it is kept at room temperature (25 °C ± 5 °C). A storage temperature outside the recommended temperature range may foreshorten the service life.

To avoid complete discharge of the battery during long term storage, the battery should be fully charged and recharged every 6 months. A completely discharged battery will not charge, as all lithium ion batteries.

SECTION 8: Exposure control and personal protection

Airborne exposures to hazardous substances are not expected when the battery is undamaged and used as intended. Personal protective equipment (PPE) is not required when the battery is undamaged and used as intended. Don personal protective equipment if the battery is damaged and you are at risk for exposure to the chemicals inside.

In the event of fire or physical damage to the battery, follow the mandatory rules for personal protection.

- **Fire or explosion:** Don a self-contained breathing apparatus (SCBA).
- **Exposure to noxious gas:** Chemical-resistant gloves and safety glasses.

SECTION 9: Physical and chemical properties

The battery is solid with a hard surface. There is no risk for exposure to the chemicals inside an undamaged battery during normal operation and transportation.

The battery is a solid and sealed unit. The battery cannot be opened to reveal the individual cells.

For additional information about the cells inside the sealed battery pack, see the safety data sheet provided by the cell manufacturer.

Cell manufacturer

- **Manufacturer:** Lithium Werks
- **Manufacturer's website:** <https://lithiumwerks.com/>

SECTION 10: Stability and reactivity

The battery is stable. No specific handling requirements apply.

Avoid exposing the battery to fire or temperatures above 80 °C. Do not disassemble, crush, short or install the battery with incorrect polarity. Avoid mechanical or electrical abuse. Do not immerse in seawater or other high conductivity liquids.

The battery will release toxic fumes if burned or exposed to fire. Breaching of the individual cell enclosure may lead to generation of hazardous fumes which again may include extremely hazardous hydrofluoric acid (HF).

SECTION 11: Toxicological information

Acute oral, dermal and inhalation toxicity data are not available for this battery.

Risk of irritation occurs only if the battery is abused to the point of breaking the container and opening it to reveal the individual cells. If this occurs, irritation to the skin, eyes and respiratory tract may occur.

SECTION 12: Ecological information

Provided that the battery pack is disposed of according to local regulations and/or law, it will not have any environmental impact.

SECTION 13: Disposal considerations

Adhere to applicable laws, regulations and guidelines when disposing of the batteries.

A lithium thionyl chloride battery does not contain any heavy metals, and is therefore not regarded as special waste (it contains only biodegradable parts).

A used lithium battery can contain a significant amount of residual energy. It is the danger of explosion that presents a problem when disposing of a battery. Used batteries must therefore be handled with the same care as new ones.

Note

For safe disposal, contact the nearest local company that has been approved to collect and dispose of lithium batteries.

SECTION 14: Transport information

Transportation of the cNODE MiniS LF must take place with adherence to applicable laws, regulations and guidelines; including those who address the transportation of dangerous goods in all modes of transport. To comply with regulations for air transportation, the battery must have 30 % or less remaining capacity.

The battery is certified according to UN 38.3.

- **Shipment of transponder**

Each cNODE MiniS LF transponder is transported as a closed and sealed unit, and must not be opened by unauthorized personnel.

The cNODE MiniS LF transponder must be shipped in accordance with the prevailing national regulations; **UN 3481 PI 967 Section II**, *Miscellaneous (Lithium Ion batteries included in equipment)*.

- **Shipment of separate battery**

If the battery is shipped separately, the prevailing national regulations that apply are: **UN 3480 PI 965 Section IB**, *Miscellaneous (Lithium Ion battery)*.

For all shipments – cNODE MiniS LF and separate batteries –, use lithium battery handling label as specified in the additional requirement of Section II of packing instructions 965, 966 and 967.

Transport identification codes:

- **Aircraft:** IATA DGR
- **Sea transport:** IMDG
- **Railway:** RID
- **Road transport:** ADR

Note

Damaged transponders that are returned to the manufacturer for repair must be transported without batteries. Damaged or spent batteries that have been recalled by the manufacturer for safety reasons must not be transported by air.

SECTION 15: Regulatory information

Not applicable.

SECTION 16: Other information

The battery manufacturers' safety data sheets are available on their websites.

- Lithium Werks: <https://lithiumwerks.com>

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